

WINDSOR UTILITIES COMMISSION
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE
PROGRAM

ANNUAL REPORT - 1986

MAY, 1987



Ministry
of the
Environment

J. Bishop, Director
Water Resources Branch

WINDSOR UTILITIES COMMISSION

WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE

PROGRAM

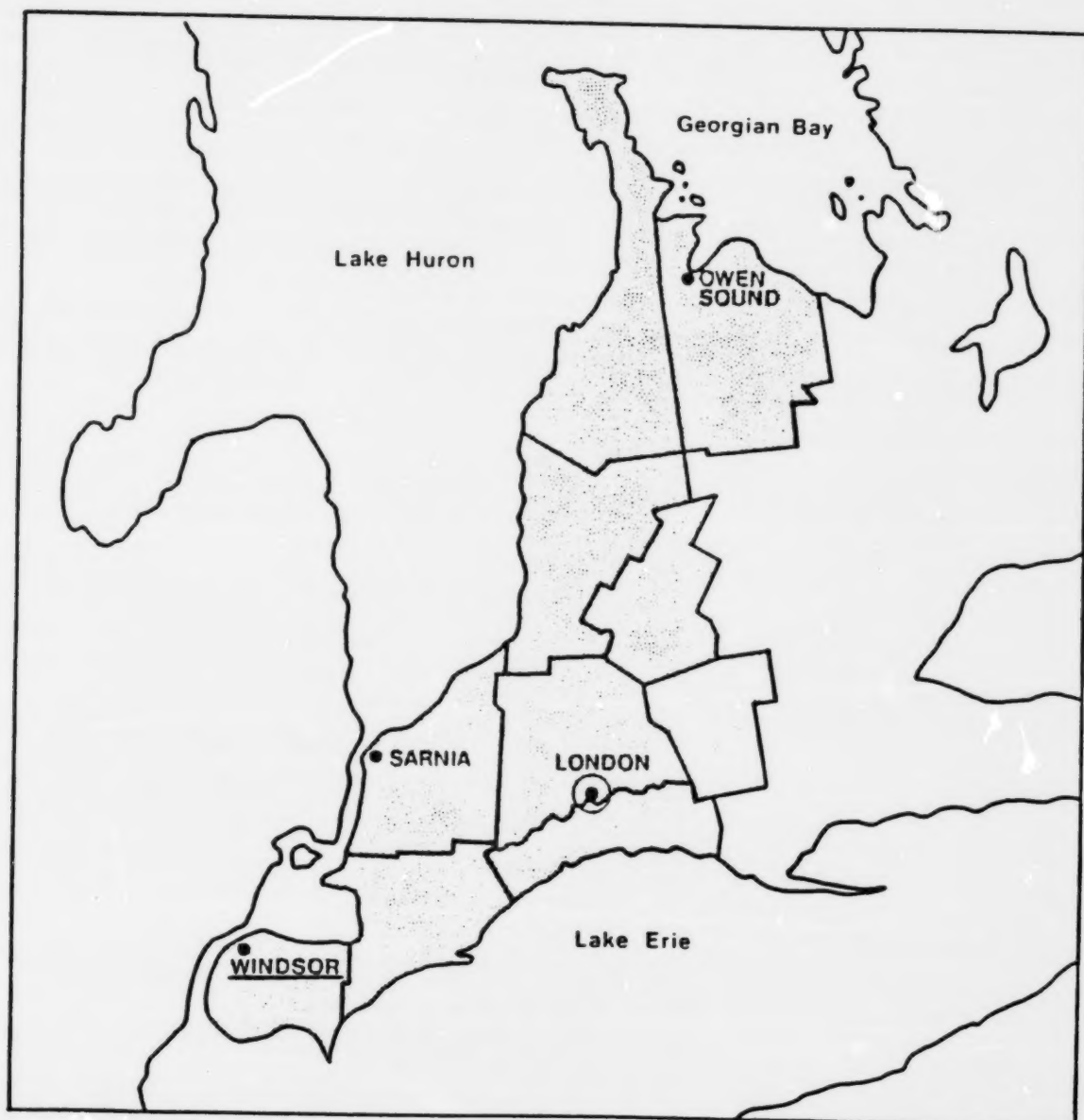
ANNUAL REPORT - 1986

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ONTARIO MINISTRY OF THE ENVIRONMENT

Southwestern Region



WINDSOR UTILITIES COMMISSION WATER TREATMENT PLANT

Location: 3665 Wyandotte Street East
Windsor, Ontario
N8Y 1G4
(519-255-2786)

Source: Detroit River

Design Capacity: 273 1000 M3/day
Operation: Municipal
Plant Superintendent: J.C. Fraser

Ministry Region: Southwestern Region
Windsor District Office
250 Windsor Avenue, 6th Floor
Windsor, Ontario
N9A 6V9
(519-254-2546)

Municipalities Served: Sandwich South (3,748)
Sandwich West (13,744)
St. Clair Beach (3,026)
Tecumseh (7,208)
Windsor (195,028)

Treatment Type: Physical and chemical treatment consisting of
coagulation, sedimentation filtration
(conventional) and disinfection as well as
fluoridation.

Chemicals Used: Prechlorination - chlorine
Coagulation - alum liquid with polyelectrolyte
Post chlorination - chlorine
Fluoridation - hydrofluosilicic acid

WINDSOR UTILITIES COMMISSION
WATER TREATMENT PLANT

EXECUTIVE SUMMARY
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The Windsor Utilities Commission, Water Treatment Plant was sampled 11 times in 1986; results are given for raw and treated samples.

The parameters analyzed fall into several categories: physical parameters and general chemistry, bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides.

The discussion of results focuses on health-related parameters found in treated water:

(a) Organic Substances

Analysis was carried out for approximately 110 organic compounds. The only volatile compounds found, trihalomethanes (THMs) were always present in treated waters; the highest level recorded for total THMs was 106 ug/L.

None of the pesticides analyzed for was found in treated water.

No chlorophenolic compounds were found.

Only two other organic compounds were found at quantifiable levels in treated water at this supply, both chloroaromatics; 1,2,4,5-tetrachlorobenzene was found at 11 ng/L and 2,3,6-trichlorotoluene at 91 ng/L.

(b) Other Parameters

The aesthetic ODWO* for organic nitrogen was exceeded in four treated water samples and the ODWO for turbidity also in four. Of the other physical, general chemistry and microbiological parameters and metals analyzed, for which there are health-related ODWO, none exceeded the objectives, in treated water.

The results of these analyses are consistent with those obtained in other areas of the Great Lakes.

The treated water from the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

* The Ontario Drinking Water Objectives, revised 1983.

WINDSOR UTILITIES COMMISSION
WATER TREATMENT PLANT
SUMMARY TABLE OF RESULTS
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The Windsor Utilities Commission, Water Treatment Plant was sampled 11 times in 1986.

PARAMETER CATEGORY	TYPE OF SAMPLE	
	RAW	TREATED*
1. GENERAL CHEMISTRY - includes anions such as sulphate, <u>field analyses</u> such as chlorine residual and <u>physical parameters</u> such as colour.		
Total number of parameters in category: 21		
- Total number of analyses completed	198	198
- Total number of positive results	180	144
- Number of times guidelines exceeded	N/A	8
Guidelines exceeded - aesthetic ODWO** for organic nitrogen (4)		
- ODWO for turbidity (4)		
2. METALS - includes metals such as copper and lead.		
Total number of parameters in category: 24		
- Total number of analyses completed	236	237
- Total number of positive results	123	108
- Number of times guidelines exceeded	N/A	0
3. BACTERIOLOGY - includes bacteria such as coliforms.		
Total number of parameters in category: 5		
- Total number of analyses completed	38	40
- Total number of positive results	30	5
- Number of times guidelines exceeded	N/A	0
4. VOLATILES - includes compounds such as benzene and toluene; also included in this category are trihalomethanes (5 parameters), acknowledged to be produced during water treatment.		
Total number of parameters in category: 29		
- Total number of analyses completed	309	310
- Total number of positive results	4	36
- Number of times guidelines exceeded	N/A	0
5. PESTICIDES -		
Total number of parameters possible in category: 65		
- Total number of analyses completed	412	388
- Total number of positive results	2	0
- Number of times guidelines exceeded	N/A	0
6. CHLOROAROMATICS AND CHLOROPHENOLS - includes a range of chlorinated organic compounds.		
Total number of parameters possible in category: 19		
- Total number of analyses completed	155	142
- Total number of positive results	0	2
- Number of times guidelines exceeded	N/A	0

* Total number of analyses completed will not always equal the number of parameters analyzed for multiplied by number of times the supply was sampled, because of accidents during shipping or analyses or analytical difficulties.

** Ontario Drinking Water Objective.

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario is a computerized drinking water information system. The objectives of this program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- an indication of treatment efficiency of plant processes.

Program

The DWSP began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. Water supply locations have been prioritized for surveillance, based primarily on such criteria as population density, probability of contamination and geographical location.

Once the data base becomes established, an assessment of monitoring requirements for the future will be made; monitoring will be continued at the initial locations at an appropriate level and further locations will be phased on to the program as resources permit. It is

estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operation characteristics in the plant at the time of sampling.

Assessments are carried out at all locations prior to sampling in order to acquire full plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations.

Samples are taken of the raw (ambient water quality) and treated water at the treatment plants, and also in the distribution systems. In order to determine possible effects of distribution on water quality, both standing and flowing water in old and new sections of the distribution system are sampled. Sampling is carried out by Ministry of the Environment (MOE) Regional staff and/or Municipal personnel who have been trained in the applicable procedures. Comprehensive sampling kits and documented sampling procedures are made available to samplers. This ensures that samples are taken and shipped according to standard protocols and that field testing will supply reliable data. All analyses are carried out using approved documented procedures.

Data Reporting Mechanism

Final analytical results are usually received by the DWSP reporting system within 6 weeks of the time of sampling. At this time, printouts of the completed analyses are sent to the MOE District Officer and the appropriate MOE regional office, and are also retained by the DWSP co-ordinator. The DWSP is able to monitor analysis results and assess trends. Should the level of

a contaminant exceed a health-related Ontario Drinking Water Objective, action is required as outlined in the publication, Ontario Drinking Water Objectives.^{*} The DWSP issues an "Action Alert" which notifies appropriate MOE and health authorities, and supplies a history of the occurrence of the contaminant in the water supply system concerned.

Parameters Analyzed

About one hundred and forty (140) different parameters are routinely measured on DWSP covering microbiological, organic and inorganic substances of concern, as well as process parameters.

Parameters included in the program are based on the following criteria:

- probability that the substance has the potential to cause problems (health-related or aesthetic);
- probability of occurrence in ambient water;
- availability of routine analytical and sampling methods for monitoring and control purposes;
- feasibility of control.

The range of parameters includes those having Ontario Drinking Water Objectives (ODWO), World Health Organization Drinking Water Guideline values, or other

^{*} Ontario Drinking Water Objectives, revised 1983, published by the Ontario Ministry of the Environment.

jurisdiction's drinking water objectives (e.g. State of California) as well as compounds of concern to other agencies such as the International Joint Commission, and U.S. Environmental Protection Agency.

The parameters monitored routinely during 1986 are shown in Table 1; this table also includes available guidelines which are appropriate for drinking water, and the analytical detection limit (the lowest concentration that can be detected by laboratory analysis) for each parameter.

Analyses for additional pesticides may be included on certain sampling dates; such additional pesticides are selected from the list shown in Table 1A. These analyses may be done on a seasonal basis, in response to an identified concern or because of a potential for occurrence in certain locations. Seasonal analyses for specified additional pesticides are normally carried out at times corresponding to maximal agricultural use or run-off periods, i.e. in spring and fall seasons.

Drinking Water Guidelines

The Ministry of the Environment published a revised edition of "Ontario Drinking Water Objectives" in 1983.

The primary purpose of drinking water objectives is the protection of the health of the public consuming the water. Aesthetic considerations may also provide a basis for drinking water objectives, since the water should be pleasant to drink. The control of such aspects of water quality as hardness, corrosiveness, etc. is also important. The limits set are considered to outline the minimum requirements necessary to fulfill the above objectives, and may be either health-related or related to aesthetic and other considerations.

Because this survey covered such a large number of parameters, many of them did not have an ODW0. In order to be able to compare data results to health guidelines, it was necessary to refer to objectives and guidelines developed by other jurisdictions.

The footnotes to Table 1 indicate the sources and derivation of the various guidelines.

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
CHEMISTRY:					
Conductivity	-	0.01 UMHO/CM	Barium	1 mg/L	0.001 mg/L
Hardness	-	0.5 mg/L	Boron	5 mg/L	0.02 mg/L
Calcium	-	0.1 mg/L	Beryllium	-	0.001 mg/L
Magnesium	-	0.05 mg/L	Cyanide	0.2 mg/L	0.001 mg/L
Sodium	-	0.1 mg/L	Cadmium	0.005 mg/L	0.0003 mg/L
Alkalinity	-	0.2 mg/L	Cobalt	-	0.001 mg/L
pH	-	-	Chromium	0.05 mg/L	0.001 mg/L
Fluoride	2.4 mg/L	0.01 mg/L	Copper	1 mg/L	0.001 mg/L
Chloride	250 mg/L	0.2 mg/L	Mercury	1 µg/L	0.01 µg/L
Residue total (solids)	-	1 mg/L	Molybdenum	-	0.001 mg/L
Turbidity	1 FTU	.01 FTU	Nickel	-	0.002 mg/L
Phosphorus	-	0.002 mg/L	Lead	0.05 mg/L	0.003 mg/L
Phosphates	-	0.0005 mg/L	Selenium	0.01 mg/L	0.001 mg/L
Nitrogen Total Kjeldahl	0.15 mg/L*	0.1 mg/L	Strontium	-	0.001 mg/L
Ammonium Total	-	0.05 mg/L	Vanadium	-	0.001 mg/L
Colour	5 TCU	0.5 TCU	Zinc	5 mg/L	0.001 mg/L
Nitrates Total	10 mg/L as N	.05 mg/L	BACTERIOLOGY (RAW ONLY):		
Nitrite	1 mg/L as N	0.0005 mg/L	Total Coliform MF	-	0
			Total Coliform MF BKGD	-	0
			Fecal Coliform	-	0
			Standard Plate Count MF	-	0
METALS:			(TREATED ONLY):		
Uranium	0.02 mg/L(t)	0.002 mg/L†	Present/Absent (P/A) Test	Absent	Absent
Iron	0.3 mg/L	0.002 mg/L	Total Coliform MF BKGD	-	0
Manganese	0.05 mg/L	0.001 mg/L	Fecal Coliform	0	0
Aluminum	-	0.003 mg/L	Standard Plate Count MF	<500 orgs/mL	0
Arsenic	0.05 mg/L	0.001 mg/L			

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
VOLATILES:			CHLOROAROMATICS:		
1,1-Dichloroethylene	0.3 µg/L(h)	1.0 µg/l	Hexachloroethane	19000 ng/L(e)	1 ng/L
Dichloromethane	40 µg/L(c)	5 µg/L	1,3,5-Trichlorobenzene	10000 ng/L(y)	5 ng/L
TRS-1,2-Dichloroethylene	-	1 µg/L	1,2,4-Trichlorobenzene	15000 ng/L(y)	5 ng/L
1,1-Dichloroethane	-	1 µg/L	Hexachlorobutadiene	4500 ng/L(e)	1 ng/L
Chloroform	350 µg/L ⁺⁺	1 µg/L	1,2,3-Trichlorobenzene	10000 ng/L(y)	5 ng/L
1,1,1-Trichloroethane	1000 µg/L(c)	1 µg/L	2,4,5-Trichlorotoluene	-	5 ng/L
1,2-Dichloroethane	10 µg/L(h)	1 µg/L	2,3,6-Trichlorotoluene	-	5 ng/L
Carbon Tetrachloride	3 µg/L(h)	1 µg/L	1,2,3,5-Tetrachloro- benzene	-	1 ng/L
Benzene	10 µg/L(h)	1 µg/L	1,2,4,5-Tetrachloro- benzene	-	1 ng/L
1,2-Dichloropropane	-	1 µg/L	2,6,A-Trichlorotoluene	38000 ng/L(e)	5 ng/L
Trichloroethylene	30 µg/L(h)	1 µg/L	1,2,3,4-Tetrachloro- benzene	-	1 ng/L
Dichlorobromomethane	350 µg/L ⁺⁺	1 µg/L	Pentachlorobenzene	74000 ng/L(e)	1 ng/L
Toluene	100 µg/L(c)	1 µg/L	Total PCB's	3000 ng/L(t)	20 ng/L
1,1,2-Trichloroethane	6 µg/L(e)	1 µg/L			
Chlorodibromomethane	350 µg/L ⁺⁺	1 µg/L			
Tetrachloroethylene	10 µg/L(h)	1 µg/L			
Chlorobenzene	100-300 ng/L(h)*	1 ng/L			
Trifluorochlorotoluene	-	1 µg/L	PESTICIDES:		
Ethylbenzene	1400 µg/L(e)	1 µg/L	Hexachlorobenzene	10 ng/L(h)	1 ng/L
Ethylene Dibromide	0.02 µg/L(x)	1 µg/L	Heptachlor	3000 ng/L ⁺⁺⁺	1 ng/L
P-Xylene	620 µg/L(c)	1 µg/L	Aldrin	700 ng/L ^{**}	1 ng/L
M-Xylene	620 µg/L(c)	1 µg/L	PP-DDE	d	1 ng/L
O-Xylene	620 µg/L(c)	1 µg/L	Mirex	-	5 ng/L
Total Trihalomethanes	350 µg/L ⁺⁺	3 µg/L	Alpha BHC	700 ng/L(c)	1 ng/L
Bromoform	350 µg/L ⁺⁺	1 µg/L	Beta BHC	300 ng/L(c)	1 ng/L
1,1,2,2-Tetrachloroethane	1.7 µg/L(e)	1 µg/L	Gamma BHC (Lindane)	4000 ng/L	1 ng/L
1,4-Dichlorobenzene	400 µg/L(e)	1 µg/L	Alpha Chlordane	7000 ng/L ^{***}	2 ng/L
1,3-Dichlorobenzene	400 µg/L(e)	1 µg/L	Gamma Chlordane	7000 ng/L ^{***}	2 ng/L
1,2-Dichlorobenzene	400 µg/L(e)	1 µg/L	Oxychlordane	-	2 ng/L

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
Pesticides (cont'd)					
OP-DDT	30000 ng/L(d)	5 ng/L			
PP-DDD	d	5 ng/L			
PP-DDT	d	5 ng/L			
Methoxychlor	100000 ng/L	5 ng/L			
Heptachlor Epoxide	3000 ng/L+++	1 ng/L			
Endosulfan 1	74000 ng/L(ea)	2 ng/L			
Dieldrin	700 ng/L**	2 ng/L			
Endrin	200 ng/L	4 ng/L			
Endosulfan 2	74000 ng/L(ea)	4 ng/L			
Endosulfan Sulphate	-	4 ng/L			
Octachlorostyrene	-	1 ng/L			
Toxaphene	5000 ng/L	PA(xx)			

Footnotes:

- (l) = Ontario Drinking Water Objectives (ODWO) for drinking water, unless noted.
- (t) = ODWO Interim maximum acceptable concentration (IMAC) for drinking water.
- (c) = California State Department of Health Action Level for drinking water.
- (d) = ODWO for DDT (contains other isomers such as OPDDT and PPDDT).
- (e) = US EPA ambient guideline; guideline levels when it is assumed that untreated water and fish and shellfish are consumed from the same body of water.
- (ea) = United States Environmental Protection Agency (US EPA) ambient level for endosulfan (contains other isomers).
- (h) = World Health Organization (WHO) guideline for drinking water.
- (h)* = World Health Organization (WHO) Odour Threshold for drinking water.
- (x) = State of Florida, maximum contaminant level for drinking water.
- (xx) = the presence of toxaphene is detected in scan used; positive samples would be quantified by special additional analysis.
- (y) = New York State (Taste and Odour) proposed drinking water guideline.
- ++ = total Trihalomethanes.
- +++ = combined total; Heptachlor and Heptachlor Epoxide.
- * = total Kjeldahl Nitrogen minus Ammonia Nitrogen.
- ** = total of Aldrin and Dieldrin.
- *** = Chlordane is a mixture of alpha and gamma isomers.
- ‡ = Analysis changed to mass spectrometry method in mid-1986, detection limit 0.0001 mg/L.

TABLE 1A: DRINKING WATER SURVEILLANCE PROGRAM SPECIAL PESTICIDES

Dicamba	Reldan
2,4-D	Ronnel
2,4-DB	Carbofuran
2,4-DP	Propoxur
2,4,5-T	IPC
Silvex (2,4,5-TP)	Aminocarb
Picloram	CIPC
2,4,6-Trichlorophenol	Eptam
2,4,5-Trichlorophenol	Benonyl
2,3,4-Trichlorophenol	Bux
2,3,5,6-Tetrachlorophenol	Diallate
2,3,4,5-Tetrachlorophenol	Sevin
Pentachlorophenol	Sutan
Diazinon	Propazine
Dichlorvos	Atrazine
Dursban	Simazine
Ethion	Sencor (metribuzin)
Guthion	Bladex (Cyanazine)
Malathion	Prometone
Mevinphos	Ametryne
Methyl Parathion	Prometryne
Methyl Trithion	Atratone
Parathion	Alachlor
Phorate (Thimet)	Metolachlor

RESULTS AND DISCUSSION

The parameters analyzed fall into several categories: physical parameters and general chemistry (chemistry), bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides. Many of the substances analyzed for are naturally-occurring or treatment by-products.

The results of analysis of raw and treated water samples are shown in Tables 2 and 3. Table 2 shows the categories of parameters analyzed, as well as the total number of analyses which were completed in each category for both raw and treated water samples and the total number of positive results which were obtained. Table 3 lists the sampling dates and the numerical values for each parameter for which analysis produced a positive (quantifiable) result.

The Windsor Utilities Commission, Water Treatment Plant was sampled 11 times after April, in 1986.

(a) Non Organic Substances

There are 324 positive results of 396 reported analyses for physical parameters, such as pH and temperature and general chemistry tests. The results of these tests are used as an indication of the analytical validity and integrity of the samples, the general characteristics of the water, and as a guide to making an assessment of the treatment process; they may also indicate whether any changes occur during the time elapsing between sampling and actual analysis. Organic nitrogen was above the aesthetic ODWO limit four times in the treated water. Taste and odour problems can be associated with organic nitrogen levels above the

limit. Turbidity in the treated water at the plant exceeded the ODWO on three occasions; the appropriate authorities were notified on each occasion. Additional anthrafilt was added to all filter beds following the last occurrence. The exceedence did not reoccur. The field turbidity marginally exceeded the ODWO at 1.01 FTU on one occasion.

Positive bacteriological results were obtained for 35 analyses out of a total number reported of 78. These bacterial tests include those for species of paramount importance from a public health point of view, and those which assess the general bacteriological quality and characteristics of the water; by this means, a measure is obtained of the overall efficiency of water treatment processes. Positive results were obtained for treated water for standard plate count (a measure of the total number of bacteria in a water sample) with 39 organisms per mL as the highest value; the ODWO recommend that treated water not exceed 500 organisms per mL for standard plate count.

Analyses of 473 tests for metals in the water samples were reported; of these 231 were positive results. Metals can occur naturally and most are generally regarded as being ubiquitous. However, some may be present in water as a result of industrial or other discharges. A small number of metals have public health significance.

Of those parameters discussed above for which there are ODWO, none exceeded the Objectives except for organic nitrogen and turbidity. Nor did the levels exceed any guidelines for drinking water set by other jurisdictions, such as the U.S.

Environmental Protection Agency (US EPA), the World Health Organization (WHO) and Health & Welfare, Canada (H&W, Canada). Furthermore, the results of these analyses are consistent with those obtained in other areas of the Great Lakes.

(b) Organic Substances

Of a total of 619 analyses for volatile organic compounds, only 40 were positive; 36 of these were from treated water samples and were all due to the presence of trihalomethanes.

Trihalomethanes (THMs) are acknowledged to be produced during the water treatment process and will almost always only occur in treated waters. Trihalomethanes are comprised mainly of chloroform, chlorodibromomethane and dichlorobromomethane with bromoform occurring occasionally. Results are reported for the individual compounds as well as for their sum, which is expressed as total trihalomethanes (total THM). The ODWO for total THM is 350 ug/L; this level was not exceeded in any of the water samples included in this report, the highest level recorded being 106 ug/L on October 14, 1986. Due to possible backmixing with chlorinated water, four trihalomethanes were found in the raw water on June 9, 1986.

Five hundred and nineteen (519) tests were carried out for twenty three different pesticides; none was found above trace levels. On August 11, 1986 and October 14, 1986, seven special pesticides (dicamba, 2,4-DP, 2,4-D, 2,4-DB, Silvex, 2,4,5-T and picloram) were analyzed for. An additional group of special pesticides were analyzed for on October 14, 1986 (Table 1A). None of the above

parameters was found. The special pesticides analysis is carried out only once or twice a year at each supply, on a seasonal basis, to correspond to the use and/or loss of such pesticides on agricultural land. As of May 12, 1986, nine pesticides (propazine, atrazine, simazine, Sencor, Bladex, prometone, ametryne, prometryne and atratone) were monitored for monthly in both the raw and treated water. Alachlor and metolachlor were added to the above group as of July 16, 1986. Atrazine was the only pesticide found above trace levels, in the raw water on only two occasions. Atrazine was not found in any treated water samples.

Only two other organic compounds were found at quantifiable levels in treated water at this supply; these were both chloroaromatics, thus providing the 2 positive results out of a total of 273 analyses in this category. 1,2,4,5-tetrachlorobenzene was found at 11 ng/L. While no ODWO exists for this compound, the US EPA has recommended an ambient water quality criteria (assuming both fish and untreated water are consumed from the same body of water over a lifetime) of 38000 ng/L.

The chemical 2,3,6-trichlorotoluene was detected at 91 ng/L, slightly above the quantifiable detection limit. There is no drinking water guideline for this substance.

Review of these results, along with information from other DWSP sites*, would indicate that certain

* Drinking Water Survey, St. Clair-Detroit River Area. Update August 1986. Ontario Ministry of the Environment.

chlorinated compounds, such as the tetrachlorobenzenes, and trichlorotoluenes appear more frequently in the treated water than in the raw water. The Ministry of the Environment (MOE) made a submission to the liaison group of the Canadian Council of Resource and Environment Ministries and the Federal/ Provincial Advisory Committee on Environmental and Occupational Health (ACEOH) to consider setting drinking water guidelines for these compounds. The information will be forwarded to the ACEOH sub-committee on drinking water guidelines; MOE provides a representative for this sub-committee.

CONCLUSIONS

The data reveal that for metals, inorganic ions, and bacterial parameters, raw water values are frequently in the detectable range; levels of metals and inorganics are also found in treated water. The levels of metals, inorganic compounds, and bacteria are consistent with those found in other water supplies in the province.

For the organic compounds, most are below detection levels, even though the most sophisticated equipment available was employed in the chemical analysis.

ODWO have not been established for some of the compounds analyzed; for these few compounds, use was made of appropriate guidelines set by other agencies, such as the World Health Organization, the US Environmental

Protection Agency, Health and Welfare Canada or other agencies. None of these guidelines was exceeded.

The report identifies some compounds detected for which drinking water guidelines are not yet available. These

compounds have been submitted for consideration for setting drinking water guidelines to the appropriate expert groups by the Ministry of the Environment.

The treated water at the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

TABLE 2
WINDSOR UTILITIES COMMISSION
WATER TREATMENT PLANT

PARAMETER GROUP		TYPE OF SAMPLE	
		RAW	TREATED
1.	GENERAL CHEMISTRY		
-	Total samples	198	198
-	Total positives	180	144
2.	METALS		
-	Total samples	236	237
-	Total positives	123	108
3.	BACTERIOLOGY		
-	Total samples	38	40
-	Total positives	30	5
4.	VOLATILES		
-	Total samples	309	310
-	Total positives	4	36
5.	PESTICIDES		
-	Total samples	271	248
-	Total positives	0	0
6.	CHLOROAROMATICS		
-	Total samples	143	130
-	Total positives	0	2
7.	CHLOROPHENOLS		
-	Total samples	12	12
-	Total positives	0	0
8.	SPECIAL PESTICIDES		
-	Total samples	141	140
-	Total positives	2	0

Table 3

WINDSOR WATER TREATMENT PLANT DWSP RESULTS

02/11/91

027171

PARAMETERS	UNITS	SAMPLE DATE											
		86/05/12	86/05/20	86/06/09	86/07/14	86/08/11	86/08/20	86/09/08	86/09/17	86/10/14	86/11/10	86/12/08	
ALKALINITY													
MG/L-CAC R		193.200	181.300	186.600	189.100	188.700	199.50	186.500	188.900	1107.40	186.600	187.600	
T		191.800	176.700	182.500	177.600		182.300	180.800	179.300	191.500	175.000	184.000	
ALUMINUM													
MG/L-AL R		.190	1.100	.820	.170	.054	.140	.120	.130	.480	.180	.360	
T		.230	.240	5.100	.160		.210	.220	1.500	.091	.140	.100	
BARIUM													
MG/L-BAR R		.017	.024	.020	.016	.016	.008	.016	.014	.021	.015	.015	
T		.014	.013	.025	.014		.016	.015	.023	.016	.013	.015	
BORON													
MG/L-BO R		.030		.020	.020		.020	.020	.020	.030	.030	.020	
T		.030		.020	.020		.020	.020	.020	.030	.030	.030	
CALCIUM													
MG/L-CA R		131.100	128.500	131.100	130.500	130.500	133.200	129.000	128.800	139.200	128.100	129.600	
T		133.400	128.600	131.600	129.700		131.500	129.500	129.100	138.000	127.400	132.600	
CYANIDE													
MG/L-CN R							.020						
T													
CADMIUM													
UG/L-CD R													
T							.300						
CHLORIDE													
MG/L-CL R		19.450	19.500	110.500	18.000	6.500	110.000	18.000	18.000	113.000	7.550	9.000	
T		12.200	16.000	11.500	9.000		111.500	10.000	10.000	114.500	10.200	12.800	
CHLORINE													
H2O R		8.500	8.500	9.500	7.000	5.000	2.500	2.000		111.500		3.000	
T		2.500	2.500	2.000						2.000			
CONDUCTIVITY													
UMHO/CM R		1247.00	1228.00	1249.00	1230.00	1228.00	1258.00	1225.00	1221.00	1296.00	1222.00	1235.00	
T		1262.00	1228.00	1255.00	1227.00		1247.00	1232.00	1226.00	1293.00	1226.00	1260.00	
CHROMIUM													
MG/L-CR R		.001	.003	.002	.001		.001					.001	
T		.001		.005	.001		.001		.003				

Table 3 (cont'd)

WINDSOR WATER TREATMENT PLANT ONSP RESULTS

02/17/88

PARAMETERS	UNITS	SAMPLE DATE											
		86/05/12	86/05/20	86/06/09	86/07/14	86/08/11	86/08/20	86/09/08	86/09/17	86/10/14	86/11/10	86/12/08	
COFFER	MG/L-CU R	.140	.300	.150	.036	.270	.320	.003	.002	.017	.021	.046	
	T	.001	.007	.210	.004		.076	.001	.010	.002	.003	.004	
FECAL COLIFORM MEMBRANE FILTRATION	CF/100ML R						124,000	160,000	150,000				
	T												
IRON	MG/L-FE R	.520	1.800	1.300	.340	.340	.370	.200	.021	.480	.280	.310	
	T	.009	.022	1.600	.021		.073	.013	2.000	.012	.014	.009	
FLUORIDE	MG/L-F R	.120	.440	.190	.100	.110	.110	.100	.110	.140	.090	.090	
	T	.130	1.410	1.310	1.330		1.370	.960	1.150	.090	.980	1.050	
FIELD COMBINED CHLORINE RESIDUAL	MG/L-CL R												
	T						.170	.070	.200	.100	.200	.210	
FIELD FREE CHLORINE RESIDUAL	MG/L-CL R												
	T		1.170	1.100	1.230	1.240	.900	1.060	.900	1.150	1.100	1.010	
FIELD TOTAL CHLORINE RESIDUAL	MG/L-CL R												
	T		1.170	1.100	1.230	1.240	1.000	1.080	1.100	1.250	1.300	1.220	
FIELD PH	R		7.700	7.770	7.600	7.870	8.050	8.250	7.600	7.840	7.530	8.000	
	T		7.400	7.300	7.330	7.350	7.400	7.400	7.900	7.200	7.140	7.500	
FIELD TEMPERATURE	DEG C R		11.000	11.000	12.000	12.000	12.000	12.000	17.000	16.000	11.000	4.500	
	T		16.000	17.000	21.000	24.000	23.000	19.500	17.000	15.000	13.000	4.500	
FIELD TURBIDITY	R		9.000	14.100	110.800	5.000	200.00	6.100	155.000	115.300	111.000	120.000	
	T		9.20	640	640	760	700	680	1,010	640	550	610	
HARDNESS	MG/L-CAC R	109.50	1102.00	1112.50	1107.50	1108.50	1117.00	1104.00	1103.00	1134.00	1100.50	1106.00	
	T	1119.00	1102.50	1113.50	1105.50		1111.50	1105.50	1104.50	1130.50	1114.50		
STANDARD PLATE COUNT MEMBRANE FILT.	CF/ML R												
	T	8.000		5.000			1.000					139.000	

UNITS

Table 3 (cont'd)

WINDSOR WATER TREATMENT PLANT QMSR RESULTS

02/11/

PARAMETERS	UNITS	SAMPLE DATE									
		86/05/12	86/05/20	86/06/09	86/07/14	86/08/11	86/09/08	86/09/17	86/10/14	86/11/10	86/12/08
LEAD	MG/L-PB	R .036	.460	.100	.056	.047	.030	.005	.011	.011	.011
	T			.042							
PH	R	8.140	8.090	8.230	8.130	7.710	7.710	8.150	8.370	8.200	8.160
	T	7.950	7.840	8.040	7.780		8.170	8.050	8.100	8.130	7.800
PHOSPHORUS FIL REACT	MG/L-P	R .002	.006	.006				.003	.015	.002	.003
	T	.002	.004	.004							
PHOSPHORUS TOTAL	MG/L-P	R .033	.053	.030	.031	.035	.350	.015	.058	.036	.032
	T	.017	.006	.006	.014						
TOTAL SOLIDS	MG/L	R 161.00 CRO	186.00	185.00	189.00	148.00 CRO	1586.00	146.00 CRO	1200.00	1205.00	1154.00
	T	170.00 CRO	148.00 CRO	166.00 CRO	148.00 CRO		1169.00 CRO	151.00 CRO	1190.00 CRO	1147.00 CRO	1189.00 CRO
STRONTIUM	MG/L-SR	R .120	.095	.120	.110	.110	.053	.100	.150	.100	.110
	T	.110	.092	.120	.100		.120	.100	.140	.100	.120
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R 6.000		2.000 A3C	42.000 A3C		5800.0 A3C	1700.0	1730.00 A3C	6600.0 A3C	2600.0
	T										
TOTAL COLIFORM BACKGROUND NF	CT/100ML	R 25.000	1110.0	1800.0		120000	14500.0	1000.0	7000.0		4500.0
	T				12.000						
TURBIDITY	FTU	R 18.200	36.000	22.000	14.200	37.000	171.00	4.600	57.000	112.500	116.400
	T	6.700	1.130	3.000						.120	.440
URANIUM	UG/L-U	R				.260	.340	.350	.220	.440	.290
	T						.300	.250	.260	.200	.330
VANADIUM	MG/L-V	R .001	.002	.002	.001		.001		.001	.001	.001
	T			.004					.003		
CHLOROPHOM	UG/L	R		113.000							
	T	160.000	146.000	147.000	152.000		141.000	144.000	184.000	129.000	127.000

WINDSOR WATER TREATMENT PLANT OMSP RESULTS

02/17/P

PARAMETERS

UNITS

SAMPLE DATE

		86/05/12	86/05/20	86/06/08	86/07/16	86/08/11	86/08/20	86/09/08	86/09/17	86/10/14	86/11/10	86/12/08
DICHLOROBROMOMETHANE	R											
	T	18.000	8.000	5.000	16.000		15.000	15.000	20.000	10.000	10.000	
CHLORODIBROMOMETHANE	R			2.000			4.000	4.000		3.000	3.000	
	T	5.000	1.000	3.000	5.000		4.000	4.000	2.000	3.000	3.000	
1,2,4,5 TETRACHLOROBENZENE	R											
	T									11.000		
2,3,6 TRICHLOROTOLUENE	R			191.000								
	T											
TOTAL TRITHALOMETHANES	R			120.000			160.000	163.000	106.00	142.000	140.000	
	T	83.000	55.000	167.000	173.000							
ZINC	R	.040	.720	.065	.150	.590	.260	.027	.007	.009	.021	.022
	T	.001	.002	.140			.035		.024	.003	.001	